AGRICULTURAL MECHANIZATION

5088

CIP Code: 01.0201

Agricultural Mechanization is a year long, lab intensive course in which students develop an understanding of basic principles of selection, operation, maintenance, and management of agricultural equipment in concert with the utilization of technology. Topics covered include: small and large gas and diesel engine repair, power transfer systems including hydraulic and pneumatic systems, arc, shielded gas and gas welding, concrete, wood, metal, electricity and electronics, recirculating aquaculture systems, hydroponics systems, precision farming equipment and global positioning systems equipment, agriculture related buildings and structure: including greenhouses, agricultural industry communications and customer relations, safety and safety resources, and career opportunities in the area of agricultural mechanization.

- Suggested Grade Levels: 10-12
- Recommended Prerequisite: Fundamentals of Agricultural Science and Business or permission of the teacher
- A two credit/two semester course. This course can be offered for a second full year at an advanced level and may also be offered in a two- or three-hour block for four semesters with a maximum of twelve credit hours.
- A Core 40 directed elective as part of a technical career area.
- This course qualifies as an Academic Honors Diploma elective.
- Competencies and learning activities defined.
- This course is included as a component of the Agriculture and Natural Resources career cluster and may also be included as a component of the Mechanical Repair and Precision Crafts career cluster.

Agricultural Mechanization

A. Students shall analyze and implement safe work practices which apply to agricultural mechanics.

1. Explain the importance of safety in agricultural mechanics.
2. Identify and differentiate between safe and unsafe work practices.
3. Describe the methods utilized to implement safe work practices.
4. Identify and explain the purpose of signals and symbols in agricultural safety.
5. Explain the importance and function of an operator's manual.

B. Students shall recognize the importance of, identify and implement safe work practices in the agricultural shop.

1. Evaluate the importance of shop safety.
2. Identify and explain the role that various agencies play in regulating shop safety.
3. Identify and demonstrate the proper use of safety equipment which should be worn in the agricultural shop.
4. Locate and demonstrate the proper uses of the first aid and emergency equipment found in an agricultural shop.
5. Develop proper safety skills to use for hand and power tools.

C. Students shall examine the scope of career opportunities in and the importance of agricultural mechanics.

1. Evaluate the career opportunities in and the criteria to achieve in order to satisfy the requirements for an agricultural mechanics occupation.
2. Assess the factors involved in career decision making.
3. Examine the various SAE programs which are related to agricultural mechanics.
4. Perform a career self-analysis.

D. Students shall identify, select, utilize, and maintain hand tools, power tools, and measuring and marking devices.

1. Identify the hand tools utilized in agricultural mechanics.
2. Demonstrate the proper techniques to employ when utilizing hand tools.
3. Identify the power tools utilized in agricultural mechanics.
4. Demonstrate the proper techniques to employ when utilizing power tools.
5. Identify and demonstrate the correct use of measuring and marking devices.

6. Demonstrate the correct procedures to follow when preparing to grind and sharpen equipment.
7. Identify the correct methods for and demonstrate the proper techniques to employ when reconditioning hand tools such as hammers, twist drills, chisels, punches, and screwdrivers.
8. Identify the correct methods for and demonstrate the proper techniques to employ when reconditioning keen edge wood cutting tools.
9. Identify the correct methods for and demonstrate the proper techniques to employ when reconditioning keen edge metal cutting tools.

E. Students shall investigate and demonstrate the procedures used in basic electric wiring.

1. Define basic electrical terminology.
2. Identify and explain the basic principles of electricity.
3. Develop the abilities needed in order to read schematics and sketch wiring circuits.
4. Demonstrate a proficiency in safe wiring practices and basic wiring skills.
5. Explain and demonstrate the methods used to attach conductors to terminals, install attachment plugs, and install cord connector bodies.
6. Explain and demonstrate the methods used to make proper splices and connections.
7. Explain and demonstrate the methods used to measure electrical circuits for voltage, amperage, resistance, and wattage.
8. Explain and demonstrate the methods used to install electrical circuits, switching devices, and appliances.
9. Explain and demonstrate the methods used to install ground-fault circuit interrupters.

F. Students shall investigate and demonstrate the procedures used in basic plumbing.

1. Define basic plumbing terminology.
2. Demonstrate the proper procedures for cutting and assembling plastic pipe.
3. Demonstrate the proper procedures for cutting, threading, and assembling steel pipe.
4. Demonstrate the proper procedures utilized to connect flare and compression fittings.
5. Demonstrate the proper procedures to utilize when soldering copper fittings.
6. Demonstrate the proper procedures to follow when assembling dissimilar plumbing materials.
7. Explain the proper procedures to follow in order to maintain a water system.

G. Students shall investigate and demonstrate the proper application of basic concrete principles.

1. Define basic concrete terminology.
2. Identify and develop a list of necessary materials.
3. Demonstrate the proper methods used to construct forms.
4. Prepare a site for concrete and masonry construction.
5. Demonstrate the proper methods used to lay out a building foundation.
6. Calculate the cost and amounts of materials needed to formulate a concrete or mortar mix.
7. Explain and demonstrate the methods used to determine moisture content in sand.
8. Demonstrate the methods used to mix concrete or mortar on the job site.
9. Demonstrate the necessary techniques for conducting and evaluating a slump test.
10. Explain the necessity for and the proper procedures to use when placing concrete or masonry reinforcement.
11. Demonstrate how to properly make control and construction joints.
12. Explain and demonstrate all of the necessary steps to place, consolidate, finish, and cure concrete.
13. Explain the need for and demonstrate how to produce special finishes on concrete.
14. Demonstrate the proper methods for use and maintenance of concrete and masonry finishing tools and equipment.

H. Students shall investigate and demonstrate proficiency in basic carpentry skills.

1. Define basic carpentry terminology.
2. Identify and explain the uses for the various building materials.
3. Demonstrate the proper methods for planning cost effective construction.
4. Demonstrate the proper methods for laying out a building foundation.
5. Identify, select, and apply construction fasteners.
6. Demonstrate the proper methods for constructing buildings or building components.
7. Demonstrate the proper methods for laying out and cutting structural components.
8. Demonstrate the proper methods for construction of trusses from different types of building materials.

9. Demonstrate the proper methods for the installation of composition shingles as well as, metal and fiberglass roofing materials.

I. Students shall investigate the proper selection and application of paints and preservatives.

1. Identify and explain the uses of the materials which are needed.
2. Explain and demonstrate the correct techniques for brush painting.
3. Explain and demonstrate the correct techniques for spray painting.
4. Explain and demonstrate the proper methods of application of different types of finishing materials.

J. Students shall investigate the various methods of fencing.

1. Identify, explain the uses of, and determine the amount of materials which are needed.
2. Select fencing materials which are appropriate for the type of fence which is being built.
3. Develop a plan for the construction of a fence.
4. Demonstrate the proper method of putting up fences.

K. Students shall investigate and demonstrate hot and cold metal skills.

1. Define the basic terminology.
2. Correctly identify the different types of metal.
3. Explain and demonstrate how to correctly cut, file, shape, and drill metal.
4. Explain and demonstrate the methods used to correctly solder copper joints, sheet metal, and electrical connections.
5. Explain and demonstrate the correct use of heat treating tools.
6. Explain and demonstrate how to join metals with appropriate fasteners.
7. Explain and demonstrate the proper procedures for cutting threads with taps and dies.
8. Explain and demonstrate the methods utilized to lay out and drill holes with a twist drill.
9. Explain and demonstrate how to bend sheet and strap steel to angles or shapes.
10. Explain and demonstrate the proper procedures for repairing damaged threads.
11. Identify and explain the uses for the equipment needed for electric arc welding.
12. Demonstrate how to correctly operate electric arc welding equipment.
13. Explain and demonstrate the proper procedures for laying out and preparing metal for arc welding.

14. Demonstrate proficiency in the proper methods utilized to weld basic joints in all positions.
15. Demonstrate the methods used to join pipes by welding.
16. Demonstrate the procedures to follow when preparing for and applying hard surfacing alloys.
17. Identify and explain the uses for the equipment needed for oxy-fuel welding and cutting.
18. Demonstrate how to correctly operate oxy-fuel welding and cutting equipment.
19. Explain and demonstrate the need to light and adjust the torch flame for specific welding or cutting operations.
20. Demonstrate the procedures to follow when laying out and preparing metal for welding or cutting.
21. Compare and contrast fusion and braze welding joints on mild steel and cast iron.
22. Demonstrate the proper methods for cutting mild steel, including pipe.
23. Demonstrate the proper methods utilized to join steel pipe, tubing or shapes by welding.

L. Students shall investigate the operation of small engines.

1. Identify and explain the function of the following systems and components:
    a. Air and fuel intake and carburetion system
    b. Ignition system
    c. Cooling components
    d. Lubrication system
    e. Combustion components
2. Explain and demonstrate how to service and maintain fuel, air intake, exhaust, cooling, and lubrication systems.
3. Explain the methods used in the generation of electricity and the production of a timed spark.
4. Explain the methods used in the combustion of fuel and the generation of usable energy.
5. Identify the individual parts of a small engine.
6. Describe the function of the following:
    a. Engine governor
    b. Hot vs. cold spark plug
    c. Air cleaner
    d. Cooling fins
    e. Crankcase breather

f. Carburetor choke
g. Condenser
h. Breaker points
i. Engine oil
j. Cam shaft
k. Connecting rod
l. Piston and rings

7. Compare and contrast a 4 stroke-cycle and a 2 stroke-cycle engine.
8. Explain and demonstrate the proper methods for using engine overhaul equipment, including valve, cylinder, piston, seal, and bearing tools.
9. Explain and demonstrate proficiency in the use of measuring tools and test instruments such as micrometer, thickness gauge, telescoping and small hole gauge, dial indicator, compression tester, torque wrench, tachometer, coil-condenser tester, ignition timing tester, ignition circuit tester, and VOA (volt-ohm-amp)-meter or DMM (digital multi-meter).
10. Explain and demonstrate the methods for assembling and adjusting ignition and fuel systems.
11. Demonstrate the proper methods for operating an engine and adjust or check ignition timing, engine speed, and carburetor adjustments.
12. Troubleshoot, evaluate and replace valves, electrical, governor, and carburetion parts.